Summary on verification of August 2002 WRF retrospective runs

Hui-Ya Chuang and Geoff DiMego

MMB/EMC/NCEP

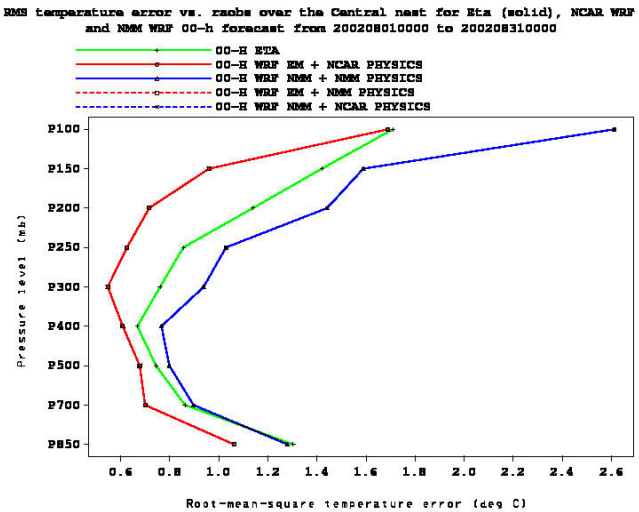
Initial Conditions

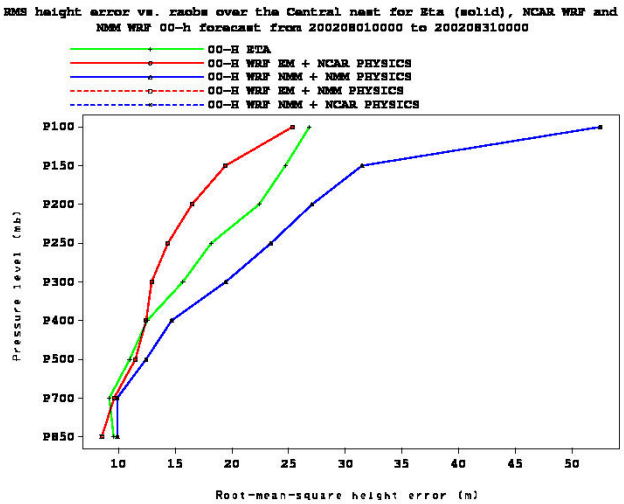
- Eta runs were initialized from the Eta data assimilation system, which presumably has the advantage of providing better physical balancing, even though 00 h RMS errors show that Eta ICs did not usually have the best fit to Raobs.

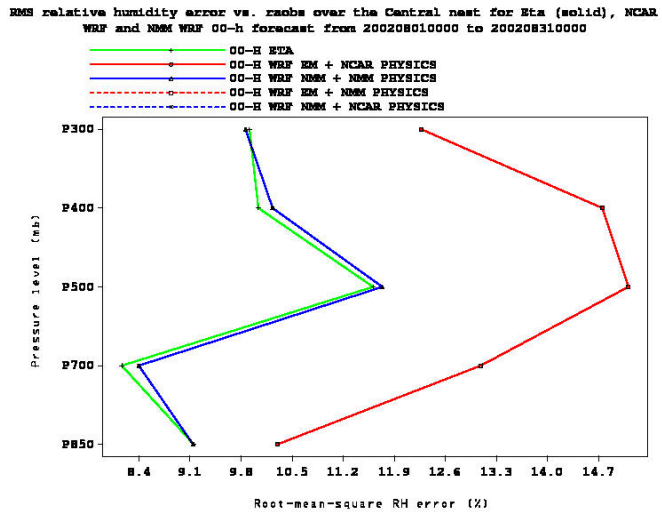
- All WRF runs were initialized from the WRF SI which performed static interpolations from: 1)RUC for WRF EM, and 2)ETA for WRF NMM.

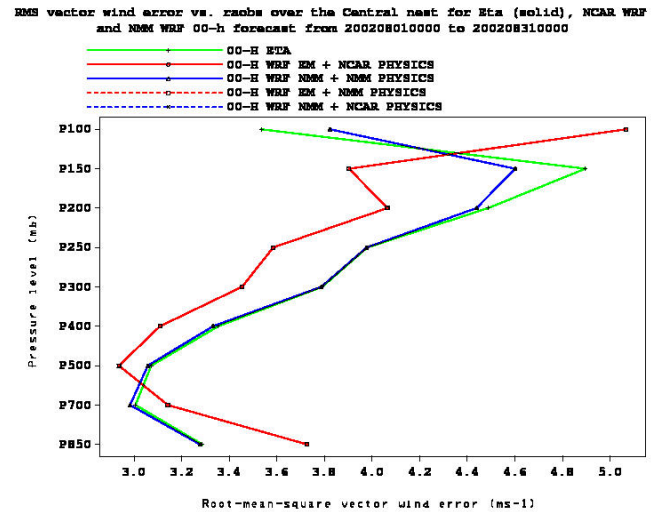
- For the Central domain, initial conditions for the two WRF EM runs generally had the least RMS errors except for RH (will check WRF post processor to see if RH was processed incorrectly for WRF EM).

Initial Conditions



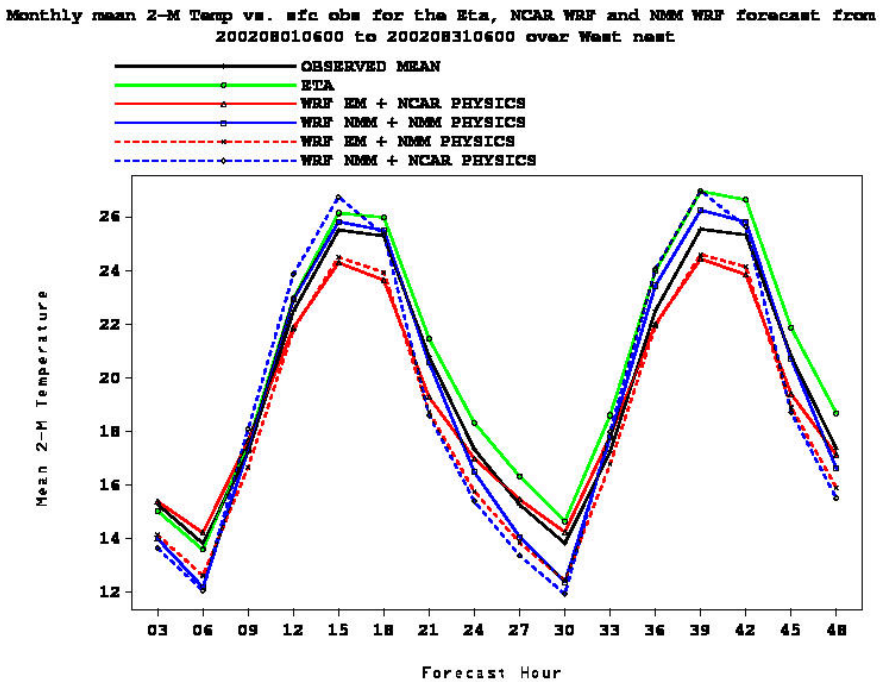


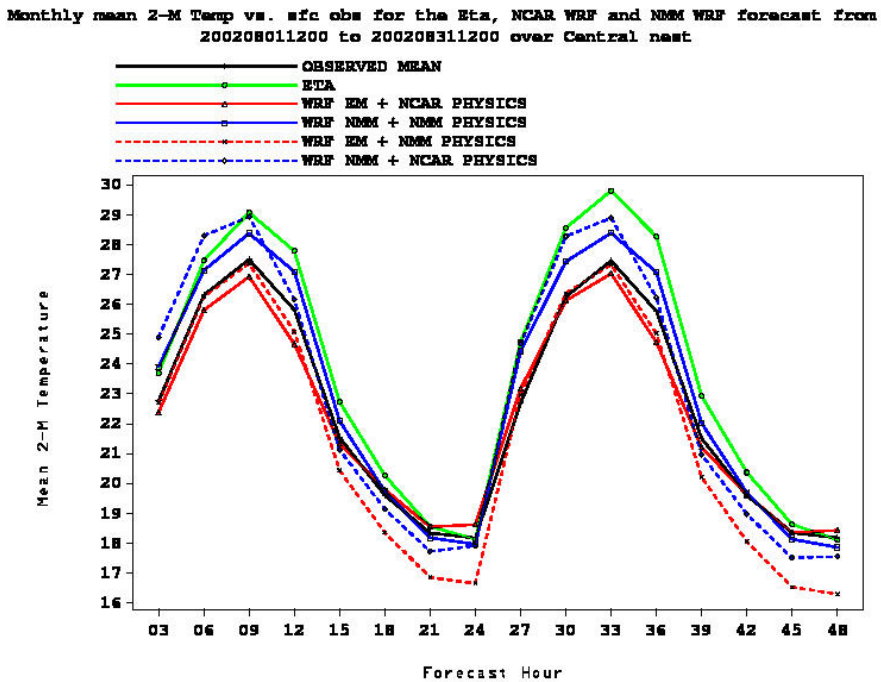




2 M Temperature Errors

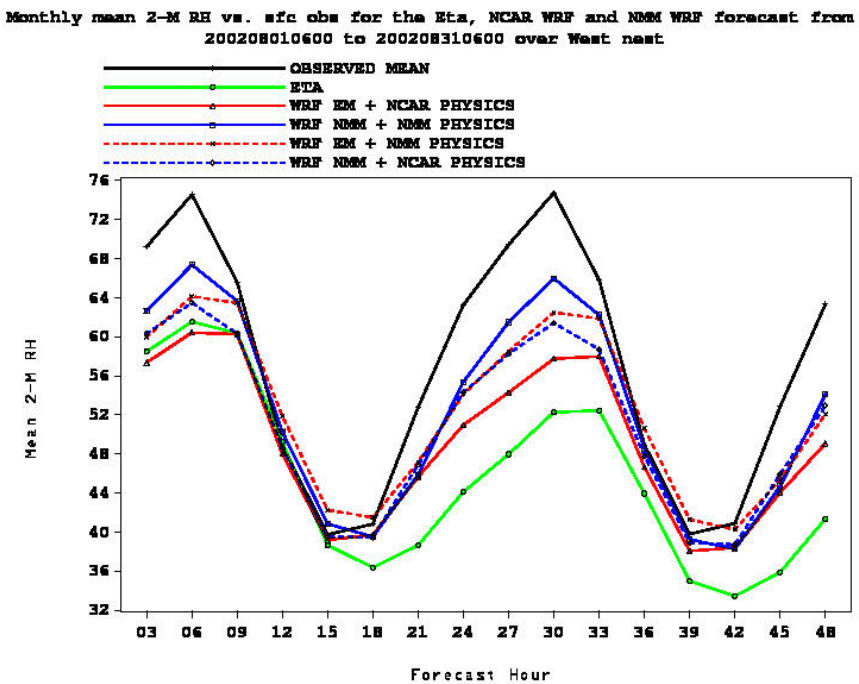
- During the day, both WRF NMM runs had warm biases while both WRF EM runs had cold biases. At night, all but WRF EM control runs had cold biases, which were especially pronounced in the western domain.

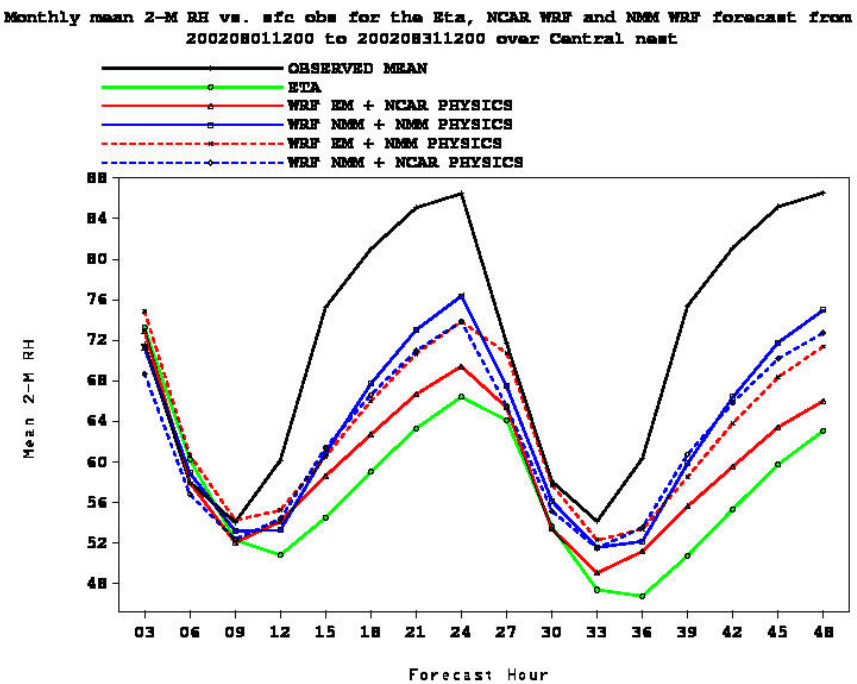




2 M RH Errors

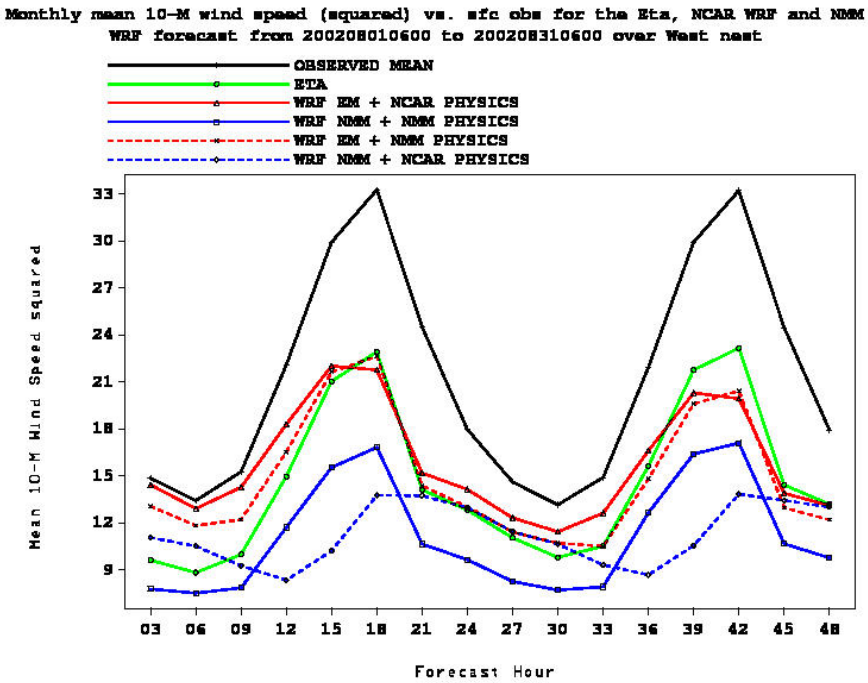
- All the models under-predicted RH at night. Most models also under-predicted RH during the day. The under-prediction of the 2 m RH in the Eta model was the most pronounced.

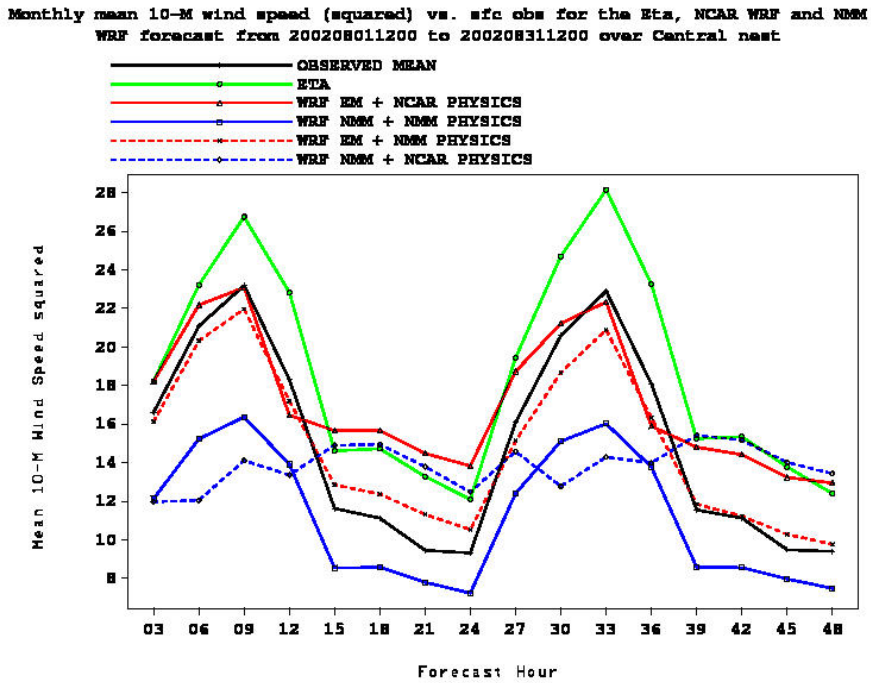




10 M Wind Errors

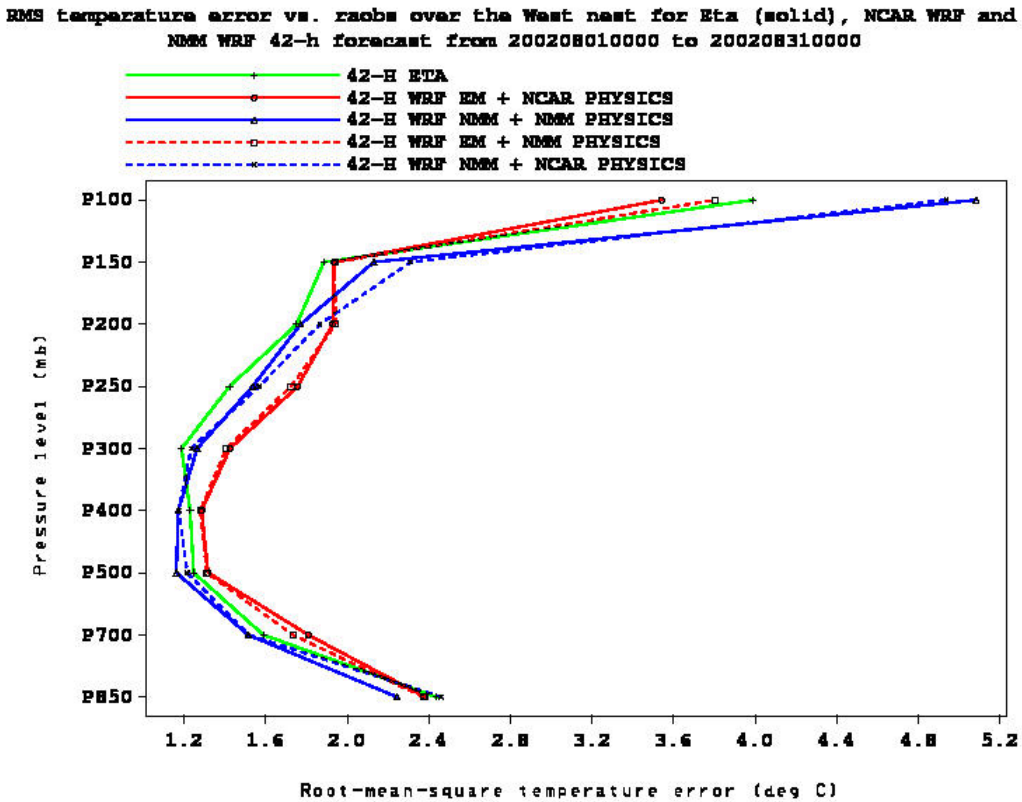
- In the western domain, all models under-predicted 10 m wind throughout 48 h forecast, especially during the day.
- In the central domain, the two WRF EM runs provided the best 10 m wind forecast during the day.





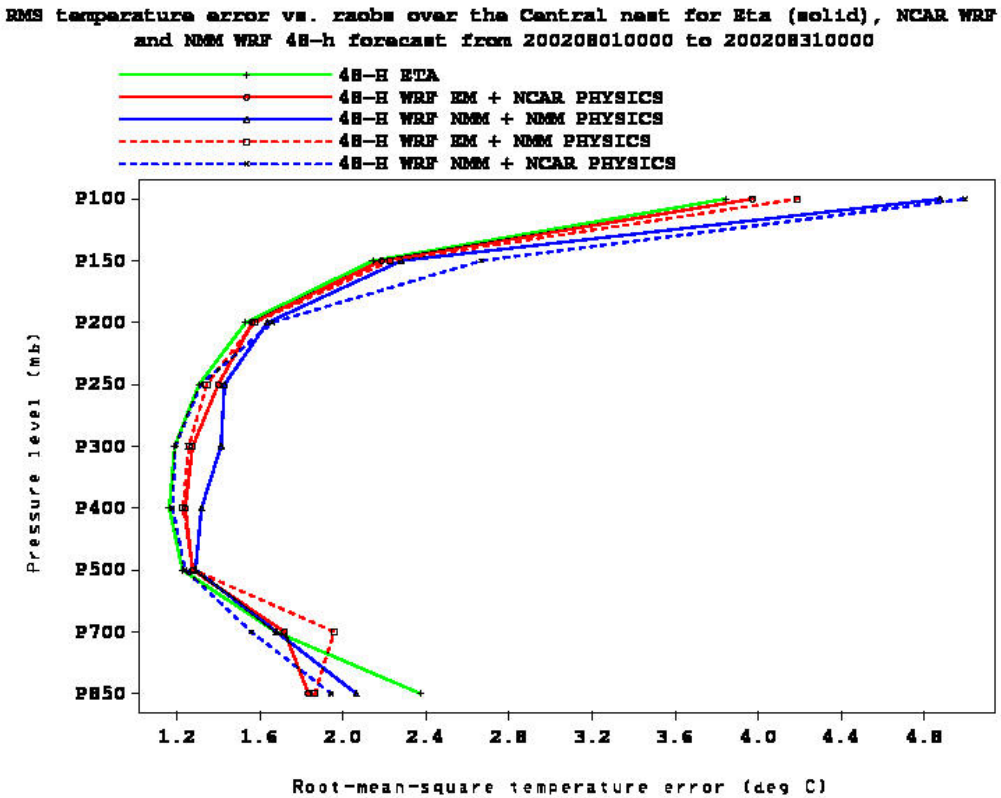
Temperature RMS Errors

- In the western domain at 42 h, the two runs with the same dynamical core had similar RMS errors. In addition, the two WRF NMM runs had the smallest RMS errors below 300 mb.



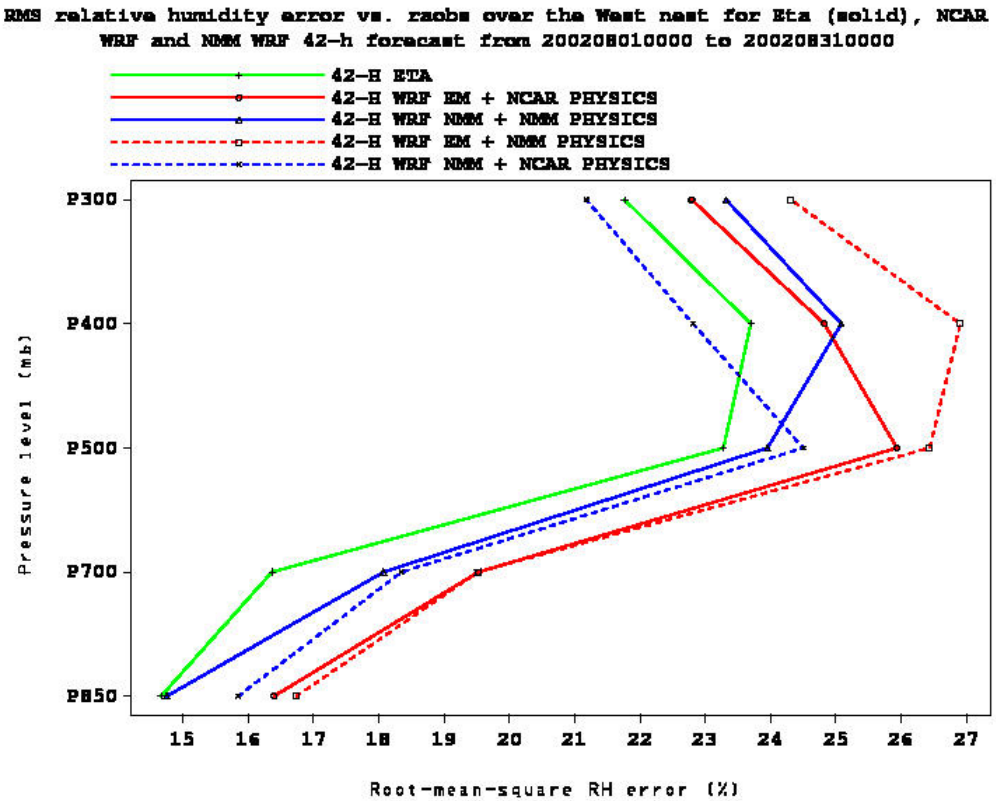
Temperature RMS error

- In the central domain at 48 h, the WRF NMM run with NCAR physics had the smallest RMS error below 250 mb. The two WRF EM runs still had similar RMS errors at most levels.



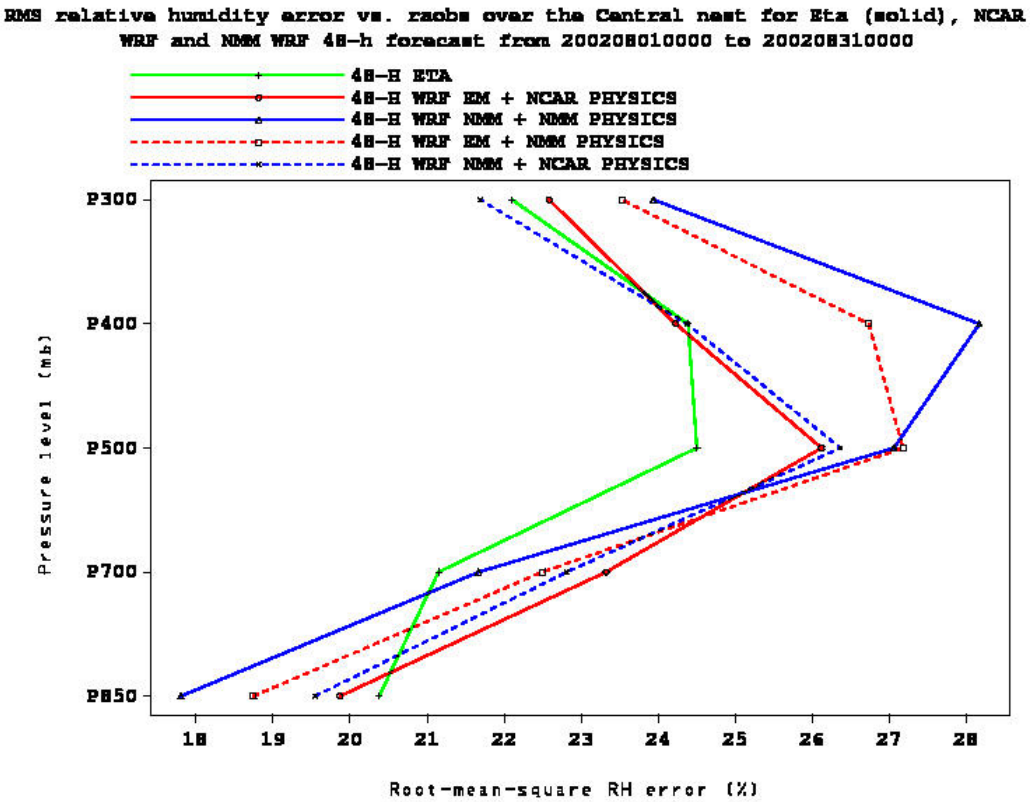
RH RMS error

- In the western domain, the WRF runs with the same dynamical cores had similar forecast errors. The Eta had the smallest errors below 500 mb.



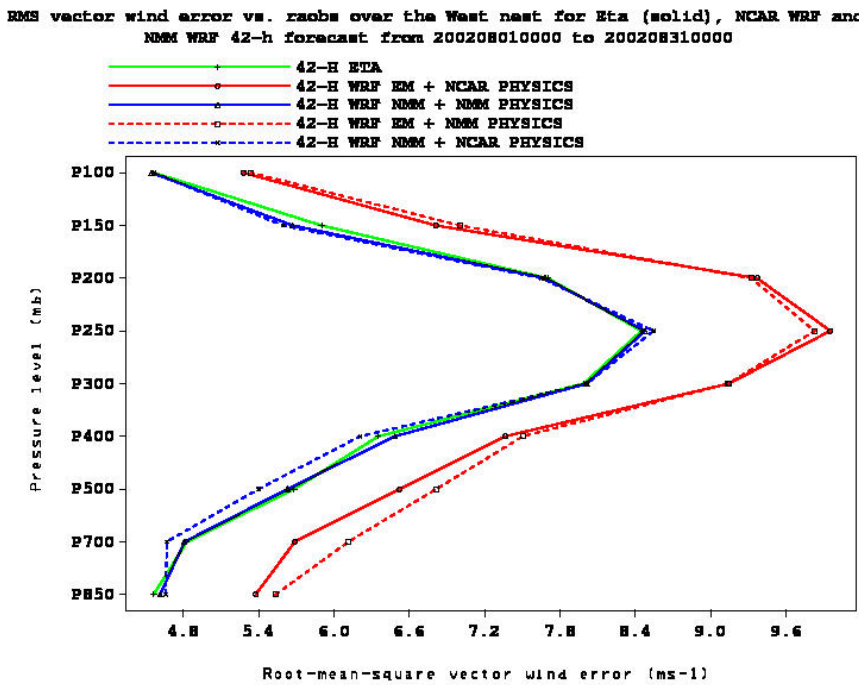
RH RMS error

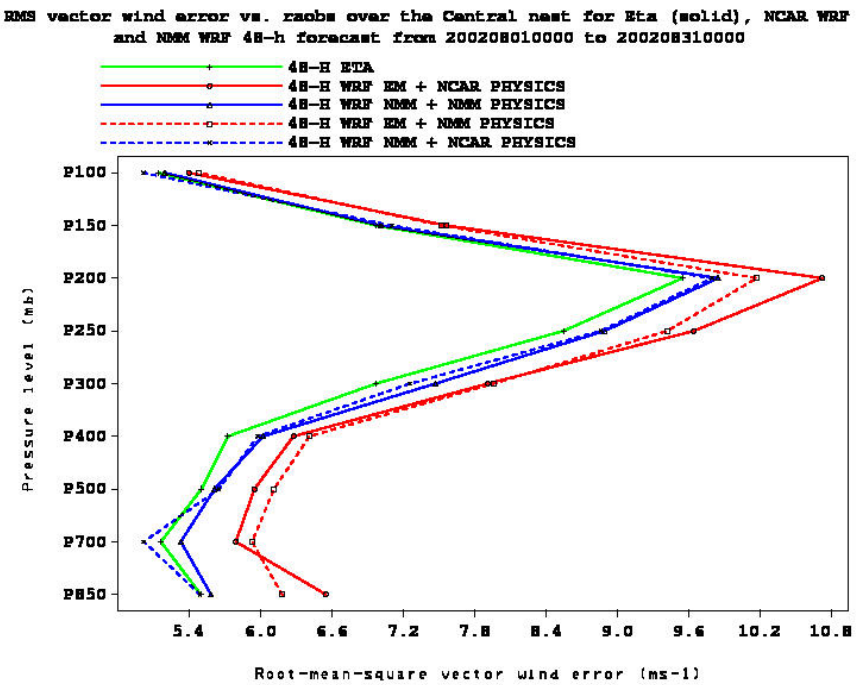
- In the central domain, the WRF runs with the same physics package had similar forecast errors above 500 mb.



Wind RMS Errors

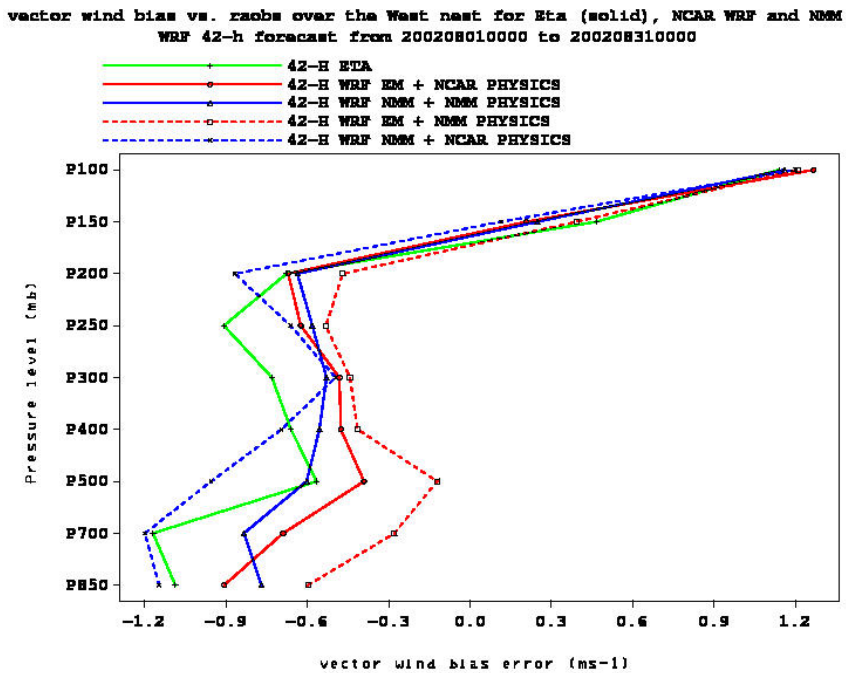
- Two WRF EM runs had relatively large RMS errors in both domains throughout most forecast times, compared to the other three models.

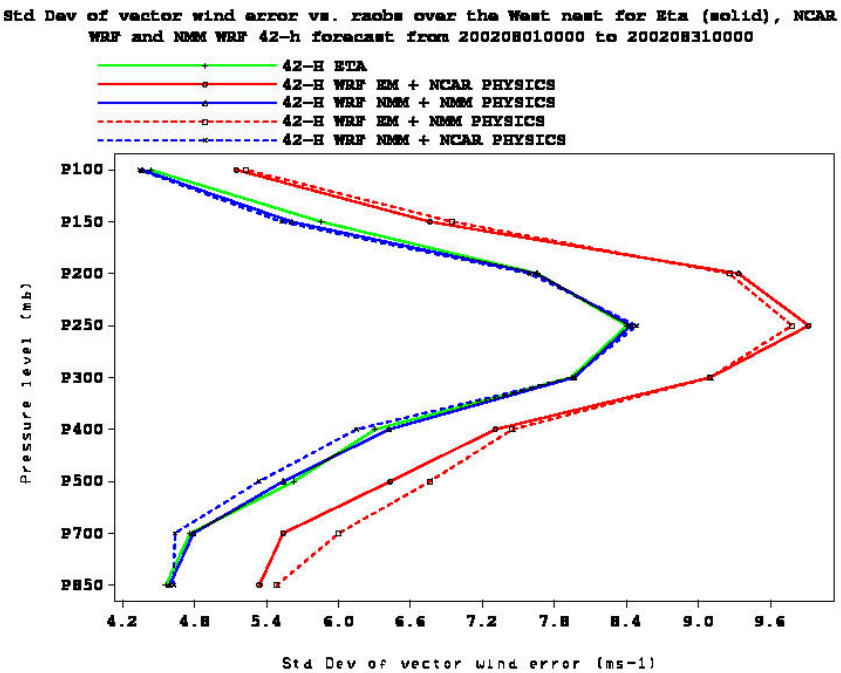




Wind Errors

- The fact that the two WRF EM runs had small mean biases but large RMS errors was consistent with their large standard deviation of wind errors.





Summary

- The summary stats for shelter level fields indicated that the runs with the same dynamical core, not the same physics package, had similar biases during the day. At night, only the WRF EM runs did not have cold biases.

- In the western domain, the upper air forecast errors also had a greater dependency on the use of dynamical core rather than on the physics package.

- In the central domain, the two WRF EM runs still had similar forecast errors except for the RH fields. The two WRF NMM runs had similar forecast errors in height and wind fields.

Summary

- The wind forecast in both WRF EM runs had relatively large RMS errors and standard deviation of errors but small biases.

- The use of different initial conditions in different dynamical cores could possibly contribute to the forecast error similarities between the same dynamical cores and the large wind errors in the WRF EM runs.